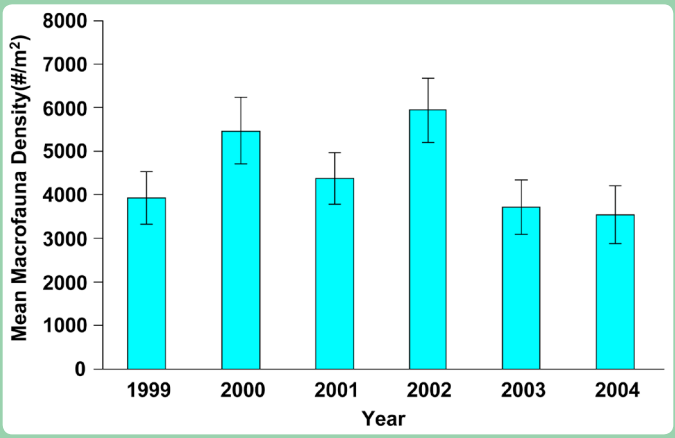
Box 3.4.2 Rainfall, Salinity and Benthic Invertebrates

How does salinity affect estuarine benthic communities?

Salinity in an estuary varies with daily tides, season, volume of fresh water inflow, and proximity to the open ocean. Estuarine salinities are usually highest at the mouth of a river where ocean water enters, and lowest upstream where freshwater inflow is greatest. However, drought conditions can significantly alter the water quality of an estuary, particularly by allowing high salinity water to penetrate further upstream. Salinity is the major natural environmental factor controlling the distribution of benthic organisms in estuaries (Attrill & Power, 2000; Magnien *et al*., 1987). While benthic estuarine fauna are adapted to handling a fairly broad range of salinities, unusually high or low salinities and large changes in salinity can negatively affect their survival, growth and reproduction. During the current SCECAP study period, average salinity decreased and salinity ranges increased in both tidal creek and open water habitats as compared to previous study periods. Concurrent with this change was a 30% decrease in the mean number of organisms per m^2 collected by SCECAP sampling in South Carolina's sediments. Additionally, seven stations sampled in the current study period had salinity ranges greater than 20 ppt throughout a 25-hour monitoring period. Six of those stations also had low densities of benthic organisms (<1000/m^2), suggesting evidence of biological stress. This trend may reflect salinity effects directly, but it also may reflect other factors associated with increased terrestrial runoff, such as increased contaminant loads.



Abundance of benthic organisms (mean number per m^2) collected each year since the start of SCECAP monitoring in 1999.

and overall species diversity per grab were higher in open water habitats (S = 18.8, H' = 2.75) than in tidal creek habitats (S = 15.2, H' = 2.49) during the current study period (Figure 3.4.5). Although not significant, the trend of higher values at open water stations was also observed in the two previous study periods. No significant differences were observed in the average number of species or diversity estimates per grab among the three survey periods conducted to date, when all stations were considered collectively or when both habitat types were compared separately.

In order to compare the general taxonomic composition of organisms collected during each study period, all benthic species were classified into one of four groups: polychaetes, amphipods, mollusks, or other taxa (primarily oligochaetes, nemerteans, isopods, and decapods). The mean abundances of amphipods and mollusks were significantly greater in open water than in tidal creek habitats ($p = 0.013$; $p=0.032$, respectively). Polychaetes and other taxa were found in greater abundances in tidal creek habitats than in open water habitats, but these differences were not significant ($p > 0.05$). The percent abundance of polychaetes observed in both habitat types during 2003-2004 was very similar to that observed in the 1999-2000 survey, but about 10% lower than observed during the 2001-2002 survey period (Figure 3.4.6). Slightly higher percentages of amphipods and lower percentages of other taxa were found during the current sampling period at open water habitats when compared to the two previous study periods, while the opposite trend was observed at tidal creek habitats (Van Dolah *et al*., 2002a; 2004a). Minimal